VORTEX CRANE AND HEAVY EQUIPMENT TRAINING SOLUTIONS

BUILDING REAL SKILLS AND SAFE OPERATORS

When your operators train on a Vortex Simulator, they gain the real-world skills they need to operate cranes and heavy equipment safely and efficiently.

That's because Vortex provides the most authentic simulation-based training available—we work with you to ensure that your Vortex Simulator reproduces your equipment and procedures. The result is real learning and evaluation that translates into on-the-job skills.

Vortex Simulators are designed from the ground up to prepare operators for the routine and the unexpected. The built-in learning methodology trains your operators to properly handle machines and loads, in simulated worksites that replicate actual settings and hazards.

Increased efficiency, safety, and skills: With a Vortex Simulator, your operators are trained to deliver.

by CM LABS vortex

START WITH SAFETY

Before sending trainees out on the jobsite, you need to ensure they can handle the equipment with confidence.

Vortex Simulators give your trainers the tools they need to improve worksite safety:

- Practice challenging operations without risk of injury or damage to equipment.
- Prepare operators to respond to the unexpected by experiencing system faults, load shifting, and high winds.
- Screen trainees to make sure they have the coordination and skills to perform.
- Allow trainees to safely and independently work through exercises, while you supervise another group training on real equipment.
- Measure and track trainee progress with objective performance metrics and reports.

We'll help you incorporate your learning objectives directly into the simulation. And when incidents do occur in real life, Vortex simulators can help you to recreate them so you can assess safety protocols, and apply lessons learned.

PROVEN RESULTS

Over a thousand simulators have been built using Vortex. They have been proven to accelerate training—and keep experienced operators on top of their game.

- Screen applicants for basic skills and hand-eye coordination, and improve both apprentice and experienced operator performance through repetition.
- Practice specialized or difficult maneuvers in a safe, controlled environment.
- Measure operator performance against critical criteria, including unsafe actions—and trainee responses to incidents.
- Train for new environments and equipment before they're needed on the jobsite.

REACH COMPLIANCE REQUIREMENTS FASTER

Vortex Simulators deliver a cost-effective, standards-based approach to preparing operators for certification exams.

We provide a complete set of training exercises that meet the industry standards for operator certification. In fact, Vortex clients have proven that using simulators in training results in faster time-to-competency and better success on regulatory certification tests.

Because you can reinforce operator training through after-action review and quantitative measurement of student performance, you can train more students more rapidly, and meet your certification targets more quickly.

All Vortex Simulators are based on industry requirements and recommendations from OSHA, UK-HSE, and other regulatory bodies.

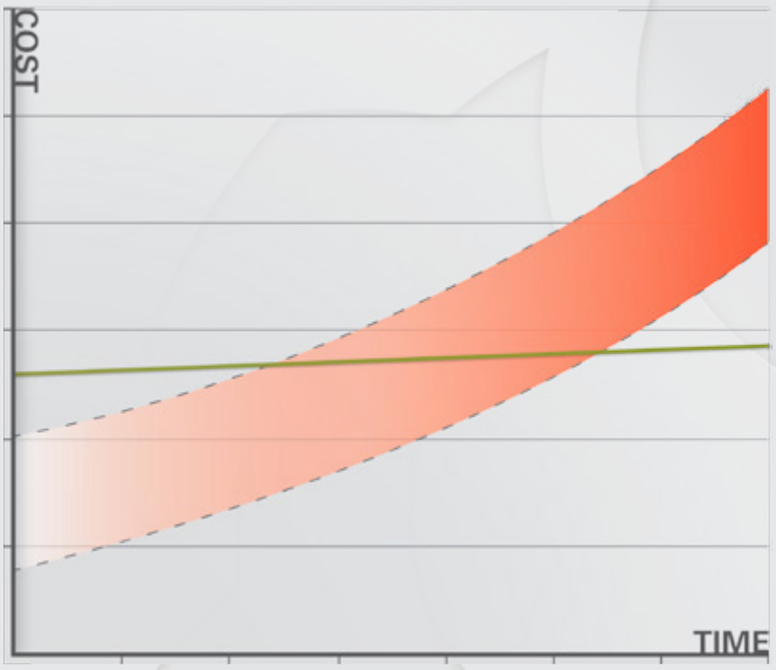
REDUCE YOUR TRAINING COSTS

Using simulators for training lowers equipment fuel costs, and reduces wear and tear on expensive equipment. Plus, you'll be able to keep your fleet in full production while operators train on the simulator.

A Vortex Simulator gives you 24/7 training potential: it's always available, regardless of the weather or actual equipment location.

Instructors have full control of a training environment that allows them to adjust the virtual work site as well as create fault conditions and challenges for the student. With hot-swappable controls, a single simulator can be used to simulate all of your equipment.

Companies that invest in Vortex Simulators see a rapid return on investment. With reduced fuel and maintenance costs as well as training time—and improved instructor-to-student ratios—the return can be measured in months.



Designed to fit into existing training installations, Vortex Simulators are compact and portable, and do not require you to allocate special environments or dedicated maintenance personnel. Your Vortex simulator comes bundled with a complete customer care package to protect your investment, including on-site installation, hardware maintenance, and software upgrades.

Owning and operating heavy equipment is costly. Student operators make mistakes, burn more fuel, and cause more wear and tear, which leads to higher training costs.

While dramatically reducing the demands on training and production machines, simulators also allow you to screen trainees before they start operating expensive heavy machinery.

Simulation-based training allows trainees to log extra hours with less supervision and very little cost. They can train 24/7—rain or shine. And by using Vortex simulators, students learn the proper use of the controls, pedals, and on-board systems—before they start operating the real equipment.

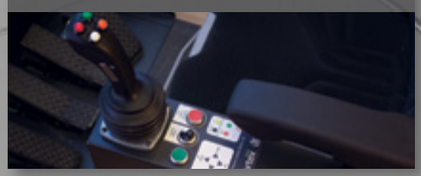
A FULLY IMMERSIVE ENVIRONMENT

1

Flat-panel high-resolution displays. Scalable display configurations range from a single-screen option to full dome projection.

2

Authentic seating and controls from heavy equipment industry suppliers. Simulators can also feature actual OEM control sets if required.



3

Hot-swappable controls make it fast and easy to switch between control sets for training on many machines.

4

A 3-degree-of-freedom motion platform replicates the motion and vibration experienced while traveling, digging, and lifting.

5

The Safe Load Indicator (LMI/SLI), auxiliary controls, and operator's dashboard are implemented on a touch screen in front of the operator.

6

Rugged industrial PCs are mounted in portable shock racks. We never use less reliable IT-type computers.

7

Durable high-quality steel frame is built tough for the stress of the jobsite.

TRAINING—IT'S NOT A GAME TO US

To some, simulation-based training is like a game. To us, it is serious business. There has been a troubling trend recently toward the use of software game engines to build simulators for equipment operations training. Game engines provide the physics found in console games such as race car and action games for Xbox, PlayStation, etc. They are designed for entertainment as well as fast—but not physically accurate—game play.

These engines are cheap (often free) and openly distributed, and hence carelessly adopted by many software developers for more serious purposes such as operator training for complex equipment. Unfortunately, many in the industry have been utilizing unreliable game engines to build training simulators.

The accuracy of these engines is so poor that there is a real risk of negative training. Game physics have not been validated, are not reliable, and should not be applied to engineering applications—after all, if the simulation isn't right, the training won't be right either. You can't reliably train, let alone qualify an operator of advanced equipment, if the simulated environment is wrong. And you can't do it without introducing unforeseen risk.

It's important to understand what's inside your simulator. Inside Vortex simulators is the Vortex Dynamics engine. This engine simulates multi-body dynamics and has been validated against empirical and engineering data.

It captures the real behaviour of cranes, heavy equipment, rigging, cables, loads, and earth moving, and gives you the precise, objective criteria you need to evaluate and train your operators.

In addition, all Vortex software development and engineering practices are ISO 9001:2008 certified—that translates into better training, and we can show you why.

Vortex results are proven. Hundreds of peer-reviewed academic research papers have been published using Vortex. It's been validated again and again in tough environments such as defense ground vehicles and robotics. It is used by Honda, John Deere, L-3, Liebherr, Lockheed Martin, NASA, and over 100 other leading companies, defense organizations and academic institutions.

INSTRUCTOR STATION

From the instructor's station, monitor the entire operation, create faults and worksite hazards, record student performance, and perform after-action review with the crew.

YOUR EQUIPMENT. YOUR OPERATIONS.

CRANES

Vortex provides training for a full range of crane types, including tower, mobile, and crawler cranes. All simulations are based on actual crane models, with real controls and functionality.

Key features:

- Training scenarios ranging from basic operator skills for hook and load management to advanced scenarios for steel erection and wind turbine construction
- Collecting and reporting of student performance metrics in order to measure trainee skills such as control of pendulum, avoiding collisions, overloads, or operating near power lines
- Training for crane set-up including outrigger placement, boom and jib configuration, and start-up procedures
- Full simulation of crane and load behavior and physical effects, including crane load charts, collisions, crane response to overloads, boom deflection, cable/sling dynamics, and wind effects
- Integrated signalman training to improve worksite communication and safe lift practices

CLIENT STORIES

KEYANO COLLEGE

One of Alberta's leading trade schools, Keyano College, purchased two Vortex Simulators for tower, mobile, and crawler crane operator training. Keyano is now developing a complete tower crane operator training program around the Vortex Simulator platform.

KIEWIT CORPORATION

Kiewit Corporation uses Vortex Crane Simulators—along with a signaler station and other learning stations—for its mobile lift-planning and crane operation training program, which allows field personnel to plan and practice lifts, and understand crane operator challenges.

NC SERVICES GROUP

NC Services Group (NCSG) purchased a 5-display Vortex Simulator with a motion platform, instructor console, and mobile and crawler crane modules. The Vortex Simulator allows NCSG to assess operators hired for specific projects, and to maintain the skills of the existing workforce.

OETIO AND IUOE

OETIO is one of North America's largest crane and heavy equipment operator training centers. It also provides IUOE training along with several other IUOE sites in the US and Canada that provide simulation-based training for mobile, crawler, and tower crane operations. With six Vortex simulators in operation, Vortex has become an integral part of training.

EARTHMOVING AND HEAVY EQUIPMENT

Vortex provides training for wheeled and tracked earthmoving heavy equipment such as hydraulic excavators, bulldozers, backhoes, graders, and dump trucks.

Key features:

- Training on basic skills ranging from boom and stick control and driving to more advanced operations such as trenching, leveling, and loading
- Dynamic soil simulation provides realistic soil excavation and blade interaction as well as the response on the machine to improper use or overloading
- Maximize simulator use and lower costs by easily changing from one type of equipment to another through the simulator's swappable control design
- Precise simulation of actual machines and vehicles, including drivetrains, wheels, tracks, booms, and blades based on exact engineering specifications

CLIENT STORIES

SAFETY RESOURCES UNLIMITED

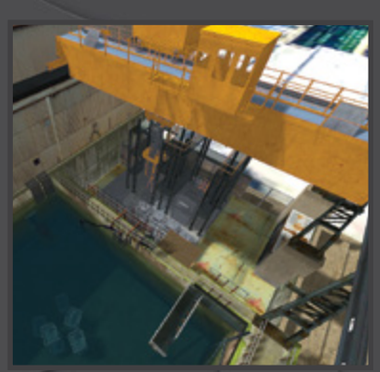
Safety Resources Unlimited (SRU) uses a Vortex crane simulator to better prepare trainees for NCCCO practical exams. It allows apprentices to get more stick-time, improve their confidence, and provide the experience necessary for the real job.

MARATHON OIL

Marathon Oil's Texas City Refinery uses Vortex Simulators for skills training for hydraulic excavator and mobile crane operators. Thanks to Vortex, operators at the Texas City Refinery are training in a safe, controlled, and environmentally friendly system.

INDUSTRIAL AND PLANT EQUIPMENT

Vortex provides training for overhead cranes, carry deck cranes, forklift trucks, and boom-truck cranes. Leading utilities, refineries, and plant operators use Vortex simulators to train staff involved in lifting operations.



Key features:

- Basic skills training in the use of lifting equipment and advanced lifts for specific plant maintenance operations
- Training in the use of carry deck, boom, and articulated-boom trucks for construction and maintenance work on worksites and plant environments
- Practice heavy lifts and plant maintenance tasks using overhead cranes
- Collecting and reporting of student performance metrics in order to measure trainee skills such as control of pendulum, avoiding collisions, overloads, or operating near power lines
- Integrated signalman training to improve worksite communication and safe lift practices

CLIENT STORIES

BNSF RAILWAY

BNSF Railway uses Vortex to provide safety awareness and operational training for its boom truck & mobile crane operators. Vortex simulator modules include a National 300B boom truck, Palfinger 14002-EH articulated boom truck, and a Grove RT530 mobile hydraulic crane.

BRUCE POWER

Bruce Power's Vortex crane simulator helps operators train for the use of overhead and carry deck cranes within the power generation plant facility. It incorporates team-based signalman training to teach safe worksite skills and lift crew communication. Specific lift scenarios for maintenance on piping and turbines were custom-built for Bruce in order to train operators on specific procedures.

ABOUT **CM LABS SIMULATIONS INC.**

For over 15 years, CM Labs' Vortex Simulators and services have helped train crane and heavy equipment operators all over the world.

CM Labs' feature-rich Vortex Simulators provide immersive, ultra-realistic learning environments that promote increased safety and operational efficiency, essential skills development, and reduced training costs.

Developed by operators, trainers, and simulation experts, our standards-based solutions prepare heavy-equipment operators for the real world.

Our expertise spans diverse areas, including construction, mining, and forestry equipment, subsea vehicles, marine equipment, industrial robotics, defense vehicles, and planetary robotics. We are the industry's go-to problem-solver for the most challenging mechanical dynamics simulations for training and testing.

All CM Labs technologies and services are backed by our multidisciplinary staff of experts, with PhDs and master's degrees in the fields of virtual reality, engineering, computing, physics, and mathematics.

Our clients include Lockheed Martin, Liebherr, John Deere, Honda, NASA, Boeing, and over 100 other world-class companies, defense organizations, and academic institutions.

CM Labs has worked with leading North American training institutes such as the Operating Engineer's Training Institute of Ontario (OETIO) to develop proven, highly effective training curricula for operator training.

All CM Labs business processes are ISO 9001:2008 certified.

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